REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the final Office Action of November 29, 2000 and the Advisory Action of June 14, 2001 is respectfully requested.

As an initial matter, the Examiner rejected several claims under 35 USC §112 in the final Office Action of November 29, 2000 due to various informal matters. In the response filed on May 29, 2001, several amendments were made to the claims in order to address these matters. In the Advisory Action of June 14, 2001, the Examiner indicated that those amendments overcame the rejections under 35 USC §112. However, because the Examiner only indicated that the amendment would be entered under the timely submission of a Notice of Appeal and an Appeal Brief, the amendments presented in the response filed on May 29, 2001 have been presented again in this Amendment, and the Examiner is respectfully requested to enter them at this time.

In the final Office Action (and the Advisory Action of June 14), the Examiner rejected independent claims 20 and 24 as being unpatentable over the Hirayama reference (USP 5,620,488) in view of Japanese reference 5-23321 (JP '321). In addition, the Examiner rejected several of the dependent claims as being unpatentable over the Hirayama reference in view of JP '321 and further in view of Japanese reference 7-56362 (JP '362). However, independent claims 20 and 24 have been amended as indicated above to clarify the distinctions between the prior art and the present invention, and new independent claims 25 and 27 have been submitted herewith. A marked-up copy of the original claims has been submitted herewith so as to indicate the changes made. For the reasons

discussed below, it is respectfully submitted that the amended and new claims are now clearly patentable over the prior art of record.

The present invention is directed to a fluidized-bed gasification method and apparatus in which combustible gas is generated in a fluidized-bed furnace and delivered to an adjacent melt combustion furnace at a controlled temperature. As discussed in the specification, it is desirable to control the temperature in the fluidized-bed furnace in order to stabilize the gasification of the combustible waste products that are poured into the fluidized-bed furnace, as well as to prevent damage to the fluidized-bed furnace due to extreme temperatures. However, the combustible waste products are formed of various materials and, therefore, have non-uniform calorific values so that they burn at varying temperatures. As a result, it becomes very difficult to control the temperature in the fluidized-bed furnace. In view of these concerns, the present invention provides an apparatus and a method of treating combustibles in which the temperature of the bed in the fluidized-bed furnace is efficiently controlled.

In particular, amended independent claims 20 and 24, as well as new independent claims 25 and 27 all now recite that a *fluidized medium* is circulated between a combustion region and a heat recovery region within a bed of a fluidized-bed furnace so that the fluidized medium is heated in the combustion region. Combustibles (i.e., combustible waste products presumably having various calorific values) are gasified in the combustion region so as to generate combustible gas, and heat is recovered from the fluidized medium in the heat recovery region of the fluidized-bed furnace. The combustible gas is then delivered to a melt combustion furnace for combustion.

As a result of the invention as recited in the amended and new independent claims, the temperature of the fluidized-bed furnace can be controlled due to the circulation of the fluidized medium and the heat recovery from the fluidized medium. Therefore, in addition to adequately controlling the temperature in the fluidized-bed furnace so as to prevent damage, a desired amount of heat can be removed from the fluidized bed. Due to the removal of this heat, it is possible to increase the amount of fluidizing gas supplied to the fluidized bed so as to sufficiently fluidize the bed of the fluidized-bed furnace. Furthermore, because heat is removed and the temperature is controlled by circulating the fluidized medium, it is not necessary to circulate combustion exhaust gas. Thus, the size of the apparatus as whole can be minimized, which will also reduce the cost.

In the Advisory Action of June 14, the Examiner asserted that the Hirayama reference and both the JP '321 reference and the JP '362 reference are not non-analogous art, in response to the Applicants' arguments submitted in the response of May 29, 2001. However, rather than asserting that the Hirayama reference and the two Japanese references are non-analogous art, the Applicants' position is that the Hirayama reference operates in a manner that is contrary to the manner in which the two Japanese references operate. Therefore, the two Japanese references would not provide any motivation to modify the Hirayama reference in order to obtain the present invention. In other words, as explained in the Applicants' remarks of May 29, 2001, the Hirayama reference and the present invention are both directed to gasification and melt combustion systems which include two stages - a gasification stage for generating a combustible gas, and a combustion stage for burning the combustible gas. In contrast the two Japanese references disclose fluidized-bed *boilers*, and teach that the combustibles are *completely combusted* in the fluidized-bed boiler. As a result, there is no

necessity in these references for recovering heat in a heat recovery region of a fluidized-bed furnace. Consequently, it is not seen how these references would motivate one of ordinary skill in the art to modify the Hirayama reference in order to obtain the present invention.

Nonetheless, although the Applicants still assert this point, the independent claims have now been amended as discussed above. Specifically, the independent claims all now recite that a fluidized medium circulates between the combustion region and the heat recovery region, and that heat is recovered from the fluidized medium in the heat recovery region. However, the Hirayama reference discloses a fluidized bed having a fluidized medium, but does not disclose or suggest that the fluidized medium is circulated between a combustion region and a heat recovery region, or that heat is recovered from the fluidized medium in the heat recovery region.

In addition, although the Examiner asserts that the JP '321 reference discloses a temperature detector 91 and controller 92 to control the temperature through out the system, and that the JP '362 reference discloses a partition wall to separate a heat recovery region and a combustion region, these references do not disclose or suggest circulating a fluidized medium and recovering heat from the fluidized medium as recited in the amended and new claims. Therefore, it is respectfully submitted that one of ordinary skill in the art would not have been motivated to modify or combine the references in a manner that would result in the invention recited in the amended and new claims. Accordingly, it is respectfully submitted that claims 12-20 and 22-28 are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicants' undersigned representative.

Respectfully submitted,

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Version with Markings to Show Changes Made

12. (Amended) A method as claimed in claim [11] 20, wherein said [fluidized-bed furnace has therein a fluidized medium, said] combustion region and said heat recovery region are separated by a partition wall and are connected above and below said partition wall, said combustion region includes first and second areas adjacent to each other, and further comprising:

supplying a first fluidizing gas as an upward flow into said first area, supplying a second fluidizing gas as an upward flow into said second area, and supplying heat recovery region fluidizing gas to said heat recovery region;

controlling a mass flow of said first fluidizing gas to be smaller than a mass flow of said second fluidizing gas to create in said first area a moving bed where said fluidized medium descends and is dispersed and to create in said second area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and

flowing said fluidized medium from said combustion region over said partition wall into said heat recovery region, and returning said fluidized medium in said heat recovery region to said combustion region; and

said controlling comprises adjusting said supplying said heat recovery region fluidizing gas to said heat recovery region.

16. (Amended) A method as claimed in claim [11] 20, wherein said fluidized-bed furnace has a substantially circular cross-sectional shape[and has therein a fluidized medium], said

combustion region comprises a circular central region, said heat recovery region comprises an outer peripheral region, said combustion region and said heat recovery region are separated by a partition wall and are connected above and below said partition wall, said combustion region includes central and peripheral areas adjacent to each other, and further comprising:

supplying a central fluidizing gas as an upward flow into said central area, supplying a peripheral fluidizing gas as an upward flow into said peripheral area, and supplying heat recovery region fluidizing gas to said heat recovery region;

controlling a mass flow of one of said central fluidizing gas and said peripheral fluidizing gas to be smaller than a mass flow of the other of said peripheral fluidizing gas and said central fluidizing gas, to create in one of said central area and said peripheral area a moving bed where said fluidized medium descends and is dispersed and to create in the other of said peripheral area and said central area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and

flowing said fluidized medium from said combustion region over said partition wall into said heat recovery region, and returning said fluidized medium in said heat recovery region to said combustion region; and

said controlling comprises adjusting said supplying said heat recovery region fluidizing gas to said heat recovery region.

20. (Amended) A method of treating combustibles, said method comprising:

circulating a fluidized medium between a combustion region and a heat recovery region within a bed of a fluidized-bed furnace such that said fluidized medium is heated in said combustion region;

gasifying [said] combustibles in [a] said combustion region of [a] said fluidized-bed furnace, thus generating combustible gas and non-combusted particles;

recovering heat from said [gasifying] fluidized medium in [a] said heat recovery region of said fluidized-bed furnace after said fluidized medium has been heated in said combustion region, so as to thereby control a temperature of said bed;

[controlling a rate of said recovering in said heat recovery region;] and

delivering said combustible gas and non-combusted particles to a melt combustion furnace and therein combusting said combustible gas and melting non-combustible ash of said non-combusted particles.

22. (Amended) An apparatus as claimed in claim [21] 24, wherein [said fluidized-bed furnace has therein a fluidized medium,] said combustion region and said heat recovery region are separated by a partition wall, said combustion region includes first and second areas adjacent to each other, and further comprising:

an air diffusion device to supply a first fluidizing gas as an upward flow into said first area, to supply a second fluidizing gas as an upward flow into said second area, and to supply heat recovery region fluidizing gas to said heat recovery region, said air diffusion device being structured such that a mass flow of said first fluidizing gas is smaller than a mass flow of said second fluidizing gas to create in said first area a moving bed where said fluidized medium descends and is dispersed and to

create in said second area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and wherein

said combustion region and said heat recovery region are connected above and below said partition wall, to allow <u>said</u> fluidized medium from said combustion region to flow over said partition wall into said heat recovery region;

said heat recovery surface comprises a member in said heat recovery region for a medium to pass therethrough; and

said air diffusion device includes a heat recovery region air diffuser at a bottom of said heat recovery region, said heat recovery air diffuser being structured to adjust the supply of said heat recovery region fluidizing gas to said heat recovery region to cause [the] <u>said</u> fluidized medium in said heat recovery region to descend therein as a moving bed and to circulate therefrom below said partition wall back to said combustion region.

23. (Amended) An apparatus as claimed in claim [21] <u>24</u>, wherein said fluidized-bed furnace has a substantially circular cross-sectional shape[and has therein a fluidized medium], said combustion region comprises a circular central region, said heat recovery region comprises a peripheral region, said combustion region and said heat recovery region are separated by a partition wall, said combustion region includes central and peripheral areas adjacent to each other, and further comprising:

an air diffusion device to supply a central fluidizing gas as an upward flow into said central area, to supply a peripheral fluidizing gas as an upward flow into said peripheral area, and to supply

heat recovery region fluidizing gas to said heat recovery region, said air diffusion device being structured such that a mass flow of one of said central fluidizing gas and said peripheral fluidizing gas is smaller than a mass flow of the other of said peripheral fluidizing gas and said central fluidizing gas to create in one of said central area and said peripheral area a moving bed where said fluidized medium descends and is dispersed and to create in the other of said peripheral area and said central area a fluidized bed where said fluidized medium is [intensely] fluidized, whereby said combustibles are gasified into a combustible gas in said combustion region while circulating therein with said fluidized medium; and wherein

said combustion region and said heat recovery region are connected above and below said partition wall, to allow said fluidized medium from said combustion region to flow over said partition wall into said heat recovery region;

said heat recovery surface comprises a member in said heat recovery region for a medium to pass therethrough; and

said air diffusion device includes a heat recovery region air diffuser at a bottom of said heat recovery region, said heat recovery air diffuser being structured to adjust the supply of said heat recovery region fluidizing gas to said heat recovery region to cause [the] said fluidized medium in said heat recovery region to descend therein as a moving bed and to circulate therefrom below said partition wall back to said combustion region.

24. (Amended) An apparatus for treating combustibles, said apparatus comprising:

a fluidized-bed furnace <u>including a bed</u> having a combustion region for gasifying [the] combustibles[, thus generating] <u>so as to generate</u> combustible gas and non-combusted particles, and <u>having</u> a heat recovery region[for recovering heat from said gasifying], <u>said fluidized-bed furnace further including a fluidized medium operable to circulate between said combustion region, whereat said fluidized medium is heated, and said heat recovery region</u>;

a heat recovery surface [for controlling a rate of said recovering] in said heat recovery region <u>for recovering heat from said fluidized medium after said fluidized medium has been heated in said in said combustion region, so as to thereby control a temperature of said bed</u>; and

a melt combustion furnace for receiving the combustible gas and the non-combusted particles and for combusting the combustible gas and melting non-combustible ash of the non-combusted particles.